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AN APPROACH TO THE PROBLEMS OF OROFACIAL DYSFUNCTION IN THE ADULT[1]

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The treatment of orofacial dysfunction is a part of physiotherapy which can often be neglected or missed entirely in a programme of rehabilitation. The face, tongue, palate and throat are areas which can be effectively treated in patients whose problem is one of muscle dysfunction. A knowledge of the muscles in these areas, combined with the physiotherapist's ability to re-train function and patience on the part of both therapist and patient will achieve the result of an improvement in this specialised area in exactly the same way as improvement occurs in any other part of the body.

The principles behind the restoration of function are similar in the face, tongue and throat to those which govern restoration of function in for example, the upper extremity.

These principles can be summarised as follows. Knowledge of the function of the area and the muscles and other structures concerned in those functions; a thorough assessment which leads to a definition of the patient's problem; treatment methods which are aimed at correcting deficits, stimulating and re-training movement patterns.

In applying these principles of treatment to the facial area, an outline of the muscles of the face, tongue and throat will be given, followed by the definition of the problem and its assessment and then a discussion of the methods of treatment available to the therapist to help re-train function in the face in speech and in swallowing.

THE MUSCLES OF THE FACE, TONGUE, PALATE AND THROAT.

The muscles of the face are well known to most physiotherapists both by name and action. They run superficially and diagonally for the most part, and can be divided into the muscles of the scalp, eye, nose and mouth. Their function is to serve or protect the organs they are near as well as to convey expression of feelings and emotions.

The buccinator however, is a deeper muscle and by keeping the cheek close to the teeth prevents food and saliva from collecting in the pocket between the teeth and cheek, and ensures that the food can be ground between the molars.

The muscles of mastication, the masseters, temporalis and medial pterygoids, raise the jaw and clench the teeth. Held up by these muscles the jaw is protracted by the lateral pterygoids and retracted by the posterior fibres of temporalis, while alternate action of each lateral pterygoid swings the jaw forward to the opposite side, giving the grinding movements of the teeth (Lockhart *et al.*, 1959).

It is interesting to note that the short neck extensors act as fixators during jaw closing while the muscles of the throat act both in clenching the teeth and in jaw opening.

The muscles of the soft palate act together to shunt food into the pharynx and prevent it rising into the nasal cavity as well as acting in speech to alter the sounds emerging from the larynx.

In speech the sealing of the nasopharynx from the oropharynx must be complete for most consonants, but is incomplete for vowels (Lockhart *op. cit.*).

The tongue relies for its action on two sets of muscles, the intrinsic muscles which change its shape, and the paired extrinsic muscles which change its position.

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The muscles of the throat with which the physiotherapist is concerned are the hyoid muscles. They are bilaterally represented and divided into suprahyoid and infrahyoid groups.

The muscles act together to anchor the hyoid bone so it can provide a fulcrum for the action of the tongue and associated acts in mastication and swallowing. In phonation these muscles produce changes in pitch of the voice. With the hyoid bone relatively fixed the thyrohyoid muscle pulls the larynx upwards when high notes are made, and the sternohyoid pulls the larynx downwards when low notes are made (Lockhart *op. cit.*).

The infrahyoid muscles are attached mainly to the sternum and clavicle although one muscle, the omohyoid is attached to the scapula. Any tightness in these muscles will affect the ability of the hyoid to rise. It is for this reason swallowing is practically impossible with an extended head and neck.

THE MECHANISM OF SWALLOWING

Food is first of all squeezed from the mouth to the back of the throat by the tongue, working in conjunction with buccinator, which acts like a flexible ram rod. The tip of the tongue remains fixed against the hard palate at the back of the teeth while the posterior part of the tongue is raised; the hyoid moves upwards a little, and the soft palate contracts downwards to squeeze the food bolus into the oropharynx like toothpaste from a tube.

The next stage of swallowing is involuntary, the nasopharynx is sealed from the oropharynx by the action of the levators and tensors of the palate; the larynx is both closed and raised upwards behind the hyoid bone, and with it, the pharynx by the action of the thyrohyoid and pharyngeal muscles. The pharynx is pulled upwards over the bolus of food while the pharyngeal constrictors propel the food into the oesophagus (Lockhart *op. cit.*).

The first part of the action of swallowing is a voluntary one, but the latter part is involuntary, brought about by the stimulus of food in the back of the throat.

To try and stimulate swallowing by other means however, the finger can be run along the line of the jaw to the hyoid bone, which causes it to rise simulating its action in swallowing. The stimulus to swallow thus produced can often be used when teaching patients who have difficulties in this area.

OUTLINE OF PROBLEMS.

When the muscles of the face, tongue and throat are affected in any way, the functional deficit may be all or part of the following: the patient may experience loss of facial expression leading to varying degrees of self consciousness; difficulty or loss of eating and drinking ability, involving inability to masticate or swallow, dribbling or slowness in eating patterns; difficulty or loss of speaking ability which may present as blurred or indistinct speech, loss of resonance and volume or inability to articulate.

Examples of the types of patients with these problems include those with facial nerve involvement, head injuries, patients with neurological disorders such as Parkinson's disease, multiple sclerosis, Guillain Barré syndrome and associated polyneuropathies, and patients with hemiplegia with associated dysarthria.

In all these patients, the role of the physiotherapist is one of re-education of muscle function, the muscles involved in speech, swallowing and expression, but not in the re-education of language, which is the domain of the speech therapist.

Where possible a close liaison between speech therapist or other members of the medical team and physiotherapist will allow the minimum amount of overlapping with the maximum amount of reinforcement of physiotherapeutic and other therapeutic techniques. For example a consultation with the speech therapist will enable the physiotherapist to work more effectively in those areas of speech and articulation where the patient is experiencing difficulty. The physiotherapist can then include those areas in her treatment programme and ideally the patient should then go straight to speech therapy where, I am assured by my speech therapy colleagues, maximum benefit from his treatment is shown by an improvement in performance during his speech therapy session.

APPROACH TO TREATMENT.

As has been mentioned, close collaboration between members of the medical team will achieve mutual and realistic goals, both short

and long term, for the patient. In addition other members of the team can be made aware of the contribution of each individual member to the total care of the patient.

If the areas of difficulty are outlined and the patient's potential for recovery assessed, the total problem confronting both patient and medical personnel is defined. Any definition of a problem depends, of course, on a very thorough and accurate assessment. The physiotherapist will look at several areas but most importantly at the function of the muscles concerned and the sensation in the area.

Assessment of Muscle Function and Sensation

The muscles of the face need to be examined to establish whether they are present or absent, weak, rigid, spastic or whether there is any imbalance thereby twisting the face into unnatural positions. Both sides of the face need to be looked at even in cases of unilateral paralysis or paresis.

The face can be divided into upper and lower halves, the upper half being particularly concerned with the eye, and the lower with the mouth, Eye closure, mouth closure and the function of buccinator being of special importance as mechanisms to protect the eye from damage and to control and stop dribbling.

Jaw movements are examined and the patients' ability to open and close the jaw and move it laterally are assessed.

Tongue protrusion and retraction and its lateral movements are examined with particular emphasis on the movements in the mouth of the tip of the tongue and the root or posterior part of the tongue. The tongue must be able to move upwards to touch the roof of the mouth both anteriorly and posteriorly. The soft palate is examined as is the tongue with the aid of a tongue depressor and the movements are noted. Deviation of the ulvula to either side on saying "ah" is observed as is the ability to elevate the palate.

The muscles of the throat can be assessed while the patient hums and also when he attempts to swallow. The larynx is moved gently from side to side by the physiotherapist while the patient is humming, and any change in tone is noted together with any difference in muscle length.

If, as in the case with some hemiplegic patients, the muscles of the throat have lost some ability to contract, the larynx can be moved more to one side than to the other.

Breathing patterns are checked and volume of sound and length of sound are also assessed.

In all basic activities the control of the head and the position of the neck and shoulder girdle are of primary importance for efficient performance. If there is no head control, or control is diminished, eating, drinking and speaking become a problem for the patient. If the movements of the neck and shoulder girdle are restricted or if there is soft tissue immobility, the same problem occurs. For good function we must make sure that these important areas are working effectively.

Finally, sensation is tested, not only to see if there is a deficit, but to ascertain the particular likes and dislikes of the patient in the important areas of taste and texture of food. Lack of sensation may be a contributing factor in difficulties in eating or moving.

Sensation is an important stimulus in re-training the functions of eating and drinking and also in re-training movements of the face and tongue.

TREATMENT

After assessment a treatment programme is planned, the results of the assessment are correlated and methods of treatment are chosen specifically to fit the assessment and needs of each individual patient.

In treatment there are three areas in need of attention, namely the face, swallowing and eating, and speech or the production of sounds. I will deal with each area separately but would like to emphasise the overlap of these three areas to a greater or less extent, depending on the severity of the problem.

The Face

This area is the easiest to treat as it is easily accessible, can be directly manipulated and its response influenced. To the individual patient however, it is of vital importance as we are often treated by the outside world according to the way we look. A smile or pleasant expression gains immediate sympathy, while an expressionless, distorted or mask-like face can lead to hostility or even to being treated as an imbecile.

The clinical problems concerning the face can be divided into two broad types; the floppy or droopy face, and the tight face.

The floppy face is one in which everything sags. The patient has a drooping eye, a dribbling mouth, a vacant expression or in the case of unilateral involvement, no lines of expression on the involved side. The problems may include eye closure, mouth closure, dribbling, eating and speaking.

The tight face is one in which nothing moves. There is a fixed expression and problems of eating and speaking because of the inability to move.

In treating these two types of facial problems stimulation of activity is the basic approach, but in the case of the tight face, relaxation of the tight structures precedes stimulation.

Methods of relaxation include the use of cold, heat, massage and resisted exercises.

The use of cold as a means of muscle relaxation has been effectively practised for many years. It is stated (Olsen and Stravino, 1972), that cooling slows motor and sensory nerve conduction and decreases the sensitivity of the muscle spindle. The resultant lowering of spindle activity enables voluntary movement to occur with greater ease. Terry towels are dipped in a mixture of crushed ice and water, wrung out and applied over the tightened structures. These towels are changed every minute or so until relaxation has occurred. Whilst in place, exercises involving other parts of the face or associated areas such as the neck and shoulder girdle, can be performed against resistance which will also cause relaxation. When resisting the muscles of the face, although the resistance as such is light, it is maximal for those muscles. After maximum effort, maximum relaxation will occur, thereby enhancing the relaxation obtained by the use of the cold packs.

Heat can be applied in the same way, using warm towels instead of cold ones.

Massage, to relax muscles must be deep enough to be effective, although in the facial area it is, as is resistance, comfortable and light.

After some relaxation has been obtained, stimulation of voluntary activity can be commenced. In the case of the floppy face it is begun immediately. Methods of stimulation include the use of peripheral sensation to stimulate motor activity, the use of stretch, that is, the use of the stretch receptors (muscle spindles) situated in the muscles to be facilitated. To enhance voluntary movement the use of irradiation and resistance, and the use of the special senses such as vision, smell, hearing and taste (Knott and Voss, 1968).

Peripheral Stimulation

Cold is again used in this context, but its method of application differs from the use of cold for relaxation. A ball of ice is made by squeezing flaked or crushed ice in a towel. Alternatively an ice block can be made by filling a suitable container with water and freezing it in the refrigerator. The ball is then rubbed quickly lightly and for a short time over the belly of the muscle to be stimulated. An increased response is then obtained on exercise. Lip closure can also be stimulated by rubbing the ice ball around the lips.

Brushing, using a fine hair bristle brush is performed in the same manner. Patients who will not tolerate ice will often respond to brushing, although the effect may not be immediate but can be delayed by up to 20 minutes (Stockmeyer, 1966).

Stretch

Stretch stimulus and stretch reflex are used as effectively on the muscles of the face as on any other muscle. The line of muscle fibres is taken into account and if these are taken to their lengthened position (stretch stimulus) the desired movement is then easier for the patient to perform. If however, stretch reflex is elicited an added response (that of the reflex) is then superimposed on the patient's voluntary contraction, thus reinforcing the movement pattern.

The Special Senses

The special senses of vision, hearing, smell and taste can be used separately or together to speed up the rehabilitation process. The use of a mirror is well known in the treatment of these patients and can be useful if the patient is not embarrassed or "put off" by his condition. The use of key words of expression can give the patient a clear idea of the movement required. For example, to ask the patient to "look surprised" is a more effective way of achieving a contraction in the frontalis muscle than to tell him to "raise the eyebrows". The

face conveys expression and the use of terms relative to emotion can help the patient achieve a movement pattern more naturally than a direct command.

Smell and taste can be used to gain movement in the areas of the nose and mouth. Movement around the nose is easier to perform if one has something either pleasant or astringent to smell, while giving the patient something to taste will enhance the movement of the lips and tongue.

Irradiation and Resistance

Irradiation or reinforcement combined with maximal resistance and guidance are the basic techniques used in treating the face. They are however, combined with stretch, peripheral stimulation and the appropriate use of the special senses to stimulate and teach voluntary control.

Irradiation, or the spread of excitation in the nervous system in conjunction with maximal resistance is a powerful tool for the physiotherapist to use in re-education.

In the face, which moves in a bilateral way (it is very difficult to perform unilateral face movements) irradiation from the "good" side in unilateral problems can be channelled into the affected side by resisting maximally the normal side and guiding the response from the affected side into the desired movement pattern.

Irradiation can also be channelled from other parts of the body to reinforce movement in the face. If the patient grips the side of the bed or chair in which he is sitting or lying when an effort to move is demanded, the response gained will be increased.

By using these methods of treatment, the patient's potentials are exploited to the full and improvement can occur and be maintained at an optimum level.

Swallowing

In re-education of swallowing and the improvement of eating function, the problem is more complex.

Swallowing, as has been mentioned, involves a series of movements, some of which are under voluntary control, and some are not. To swallow, the following movements are necessary; lip closure, tongue movements, the tension of the soft palate elevation and relaxation of the muscles of the larynx and pharynx, closure of the trachea and the forcing of the food bolus into the oesophagus.

When re-education is commenced, the voluntary phase of swallowing is stimulated and facilitated before the involuntary phase. Lip closure, tongue movements and movements of the soft palate are stimulated using the methods described for stimulation of the face. The tongue and buccinator can be resisted using a tongue depressor and the movements of the soft palate can also be guided by the same means.

Ice in the form of small amounts of flaked ice or ice chips, are given to the patient to suck to stimulate tongue movements. Flavoured ice blocks are another means of stimulation. These need to be fairly thin with a stick for the physiotherapist to hold. She can then use the ice block as a means of facilitation, directing it to the areas in need of stimulation. After the mouth has been stimulated swallowing is practised.

Ice is used to give the patient something to swallow and also, as mentioned, it stimulates the movement of the tongue. The position of the head is important in that it should be flexed so that a bypass is provided to the oesophagus and the trachea is protected by the back of the tongue. The patient needs to have an intact cough reflex and occasionally if the patient has no idea of the movement of swallowing, the gag reflex can be subliminally stimulated to give an idea of the rising and falling of the larynx and pharynx needed for swallowing.

Stimulation through pressure along the line of the jaw is given simultaneously with the patient's attempt at swallowing.

When the patient can swallow in this way with some proficiency, other forms of food are gradually introduced by either the physiotherapist, speech or occupational therapists until the patient is eating well. The physiotherapist will concentrate in treatment on jaw and tongue movement to aid the feeding process.

Speech

From the physiotherapist's point of view, her role in the re-education of speech is concerned with the making of sounds and the alteration of pitch and volume.

Working very much in conjunction with the speech therapist the physiotherapist will re-educate the lips and mouth for both mobility and strength, facilitating movement with the appropriate methods. The tongue and soft palate are also stimulated or relaxed as necessary. It is interesting to note that in patients with Parkinson's disease, the clarity of speech and volume can be increased in many cases by giving the patient ice to suck. The patient needs a little more ice than that which is used normally but the results can be dramatic. A patient who has a very indistinct and hesitant speech can be understood clearly after he has sucked some ice. Work on the lips, relaxation of the face and throat and attention to breathing patterns also help these patients.

To work effectively on pitch and volume, the larynx needs to be studied and the patient's breathing patterns checked. The larynx is moved by the infrahyoid muscles and these muscles play a part in altering the pitch of the voice. They pass diagonally upwards from the larynx to the hyoid bone and downwards to the sternum, clavicle and scapula.

If there is any tightness or lack of stability in this area these muscles will be unable to work effectively and pitch and volume will be affected. Thus attention to scapula, neck and head are important facets of treatment. Relaxation techniques are employed if tightness is a factor while facilitation techniques can be used if lack of muscle stability is hampering progress. Unless the head, neck and shoulder girdle are stable, voice production will be difficult.

The larynx can be treated directly by resistance to its muscles and by using stretch. The physiotherapist initially positions the patient in lying to relax the head and neck but later the vertical position is used as the patient improves. Instruction is given to the patient to hum either high or low. For high pitch the therapist works on the muscles between the larynx and the hyoid moving the larynx diagonally down, inwards to obtain stretch whilst the patient is humming. For low pitch she will move the larynx diagonally up and inwards whilst the patient tries to lower the pitch of his voice in response to the stretch.

Both sides of the larynx are worked, attention being paid to whichever side presents the most problem either of tightness or laxity.

Inspiration and prolonged controlled expiration is practised to improve control of voice production. Any further specific work is usually done in close co-operation with the speech therapist. The two therapists can then work together to improve the sounds the patient is experiencing difficulty in producing.

SUMMARY

The muscles of the face, tongue and throat have been discussed with special reference to their function in speech expression and swallowing.

The problems facing the patient with orofacial dysfunction are outlined and their assessment and treatment described.

I believe that physiotherapists have a great deal to offer patients in this generally neglected area. We know best how to re-educate muscles, using the same principles of re-education for the facial muscles and the muscles of the tongue, palate and throat as we do for the biceps or the tibialis anterior.

Psychologically, and functionally the facial area is of vital importance so that our patients can eat socially, speak intelligibly and convey emotion through facial expression.

Progress in this area, as in most others, comes in small amounts through much hard work on the part of both therapist and patient.

The best results however, come when the patient and the members of the medical professions work together to achieve functional goals which are realistic and oriented towards the needs of the most important member of the team—the patient.

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